United States Department of the Interior

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Zion National Park
Springdale, Utah 84767

Nevada
Environmental Protection
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IN REPLY REFER TO: N3615 (2350)

January 22, 2008

Francisco Vega
Nevada Division of Environmental Protection
Bureau of Air Pollution Control
901 S. Stewart St., Suite 4001
Carson City, Nevada 89701

Dear Mr. Vega:

The proposed Sierra Pacific Resources Ely Energy Center (EEC) project would be located in White Pine County, Nevada, 250 km northwest of Zion National Park (ZION), a Class I air quality area managed by the National Park Service (NPS). The proposed facility would consist of two new 750 MW supercritical dry-bottom pulverized coal (PC) boilers. Emissions from this project have triggered Prevention of Significant Deterioration of Air Quality Program review for pollutants which could impact air quality related values at ZION. Due to the size of the EEC project, along with the White Pine Power Plant project, and its location with respect to ZION, we are concerned that impacts from EEC alone could exceed our significance criteria for visibility impairment, and that the cumulative impacts from both EEC and the White Pine project could result in impacts that have typically been determined to be adverse. The enclosed technical review explains concerns about impacts to ZION in more detail.

Located in southwestern Utah, ZION encompasses some of the most scenic canyon country in the United States. The park is characterized by high plateaus, a maze of narrow, deep sandstone canyons and striking rock towers and mesas. The park is located on the western edge of the Colorado Plateau and borders the Great Basin and Mojave Desert Provinces. The unique geographic location and variety of life zones combine to create a diversity of habitats for a surprising array of plant and animal species.

ZION is a national leader in "green" sustainable design and reduction of carbon emissions and hazardous materials. ZION's commitment to energy efficiency, recycling, landscaping, and reduction in vehicle emissions, noise and congestion has received national attention and recognition from numerous agencies and organizations. Additionally, many of ZION's sustainable practices have resulted in significantly reducing energy consumption and associated costs.[1]

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[1] You can learn more about Zion's commitment to becoming a "Climate Friendly Park" at http://www.nps.gov/zion/naturescience/climate-friendly-park.htm

Nationwide studies indicate that the Intermountain West enjoys the best visibility in the coterminous United States, from the southern Cascades, eastward across the Great Basin and Snake River Plain, to the northern Colorado Plateau and central Rocky Mountains. ZION, which is located in the middle of this region, has been monitoring visibility since 2000. Results from that monitoring effort show that ZION is among the best in the nation for clear air and outstanding visibility. ZION is also the seventh most visited National Park in the country due to its spectacular scenic vistas. Issuance of a permit for the levels of emissions predicted in the proposed EEC and White Pine projects would compromise visibility at ZION.

We appreciate that the Nevada Division of Environmental Protection has extended the public comment period, and we are providing these comments in conjunction with those submitted by the Superintendent of Great Basin National Park. As noted in his comments, we still have several unresolved issues regarding the modeling analyses (lack of information, cumulative increment and visibility analyses), the proposed design and emissions control technology, the project's potential air quality impacts at ZION, as well as major procedural problems. It is our perception that the issuance of this permit is premature given that the analysis and disclosure of environmental impacts has not been completed by the Bureau of Land Management. We are also concerned about the cumulative impacts of this and the White Pine project on these National Parks. If you have any questions, please feel free to contact Don Shepherd of our Air Resources Division at 303-969-2075.

Sincerely,

Jock F. Whitworth
Superintendent

Enclosure

National Park Service
Comments on the Ely Energy Center Power Plant
Prevention of Significant Deterioration Permit Application
January 23, 2008

Background

The proposed Sierra Pacific Resources (SPR) Ely Energy Center (EEC) project would be located in White Pine County, Nevada. The facility would consist of two new 750 MW supercritical dry-bottom pulverized coal (PC) boilers near Ely, 63 km northwest of Great Basin National Park (NP), a Class II air quality area managed by the National Park Service (NPS), and 250 km northwest of Zion NP, a Class I air quality area managed by the NPS. Coal to fuel the facility will be transported by rail from the Powder River Basin (PRB) in Wyoming, and we understand that electricity will be sent southward toward Las Vegas and vicinity. The EEC main boiler facility would be a major source of sulfur dioxide (SO_2 = 4,578 tons per year (TPY)), nitrogen oxide (NO_x = 4,578 TPY), particulate matter (PM_{10} = 1,679 TPY), and sulfuric acid mist (H_2SO_4 = 305 TPY). Mercury emissions would be about 260 lb/yr and would be uncontrolled unless necessary to meet federal standards.

This proposed permit would be issued under the Prevention of Significant Deterioration of Air Quality Program (PSD). The purposes of the PSD program include to "preserve, protect and enhance the air quality in national parks, wilderness areas and other areas of natural, recreational, scenic or historic value" and "insure economic growth will occur in a manner consistent with the preservation of existing clean air resources" (42 U.S.C. 7470). In other words, the purpose of the PSD program is to manage growth in the context of environmental protection. For this permit application, the environmental protection context includes consideration of impacts on Great Basin and Zion National Parks. The Clean Air Act gives the federal land managers an affirmative responsibility to protect air quality related values of Class I areas, like Zion NP.

Best Available Control Technology (BACT) Analysis

Based on the review and analysis of the material received, we believe the proposed emissions from the EEC facility would significantly impact resources at Great Basin NP and Zion NP (please see the discussion below). Therefore, it is important that impacts at these National Parks be lessened. We believe that the EEC facility could achieve lower emission limits by choosing an inherently cleaner coal-based technology, or by making more effective use of the control technologies chosen for the PC boiler. Please note that it is generally understood that a source impacting a National Park is held to a higher standard and may be required to install additional controls or take additional operational measures to minimize impacts at these national treasures.

BACT definition and process: BACT applies to any pollutant for which there would be a significant net increase in emissions. BACT is defined as:

> **an emissions limitation** (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, **including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant**. (emphasis added)

It is important to note that, because BACT is an emission limit, that emission limit can be set by the permitting authority without actually specifying the design of the emission source that is to meet that limit. Thus, a permitting authority has the power to set an emission limit that it has judged to represent BACT for a broad

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source category, and then allow the applicant the freedom to determine how to meet that emission limit. According to the New Source Review Workshop Manual (NSRWM):

> Historically, Environmental Protection Agency (EPA) has not considered the BACT requirement as a means to redefine the design of the source when considering available control alternatives. For example, applicants proposing to construct a coal-fired electric generator, have not been required by EPA as part of a BACT analysis to consider building a natural gas-fired electric turbine although the turbine may be inherently less polluting per unit product (in this case electricity). **However, this is an aspect of the PSD permitting process in which states have the discretion to engage in a broader analysis if they so desire. Thus, a gas turbine normally would not be included in the list of control alternatives for a coal-fired boiler. However, there may be instances where, in the permit authority's judgment, the consideration of alternative production processes is warranted and appropriate for consideration in the BACT analysis. A production process is defined in terms of its physical and chemical unit operations used to produce the desired product from a specified set of raw materials. In such cases, the permit agency may require the applicant to include the inherently lower-polluting process in the list of BACT candidates.** (emphasis added)

So, a permitting authority does have "the discretion to engage in a broader analysis."

Clean Coal Technologies: One of the fundamental principles of pollution control is to minimize the amount of pollution generated in the first place. According to the NSRWM:

> The first step in a "top-down" analysis is to identify, for the emissions unit in question (the term "emissions unit" should be read to mean emissions unit, process or activity), all "available" control options. Available control options are those air pollution control technologies or techniques with a practical potential for application to the emissions unit and the regulated pollutant under evaluation. **Air pollution control technologies and techniques include the application of production process or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of the affected pollutant.** This includes technologies employed outside of the United States. **As discussed later, in some circumstances inherently lower-polluting processes are appropriate for consideration as available control alternatives.** (emphasis added)

We believe that a technological solution is now available that would allow use of coal to generate electricity without the large quantities of emissions associated with pulverized coal-fired boilers. Integrated gasification combined cycle (IGCC) is a rapidly-developing technology that has now been demonstrated by Tampa (Florada) Electric at its Polk Generating Station to be clean, reliable, and economical.[2] Because this technology is developing so rapidly, SPR's criticisms of IGCC that are based upon 2006 information and pronouncements[3] have been overtaken by current events. With the problems of reliability addressed by operating experience and inclusion of redundant equipment, and with major vendors providing complete, integrated systems, reliability should continue to improve.

Although IGCC is currently 10% to 20% more expensive to build than an equivalent PC facility, energy industry experts[4] contend that that cost disadvantage will be partially or entirely offset when national

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[2] At a 2006 workshop in Denver on clean coal technology, a representative of Tampa Electric related that the Polk IGCC is now its most reliable unit in its system and is dispatched first because it is also the most economical.

[3] As a result of a legal settlement, EPA has withdrawn its objection to inclusion of IGCC in BACT analyses.

[4] "IGCC 101" presentation by Steve Jenkins, CH2M HILL at Colorado's New Energy Economy Conference, October 30, 2007, Denver, CO (http://www.dora.state.co.us/puc/projects/NewEnergy/PathForward/PF10-30-07SJenkins-CH2M_IGCC101.pdf).

legislation requires carbon dioxide (CO_2) capture and sequestration.[5] While switching to IGCC would not reduce the millions of tons of CO_2 produced by the EEC facility every year, those millions of tons would be concentrated in the IGCC exhaust by a factor of 10 to 100 times smaller than the exhaust from a PC, thus reducing the inevitable cost of capture by one – two orders of magnitude. And, in addition to the advantages in capturing CO_2, a well-controlled IGCC facility would emit far less of the conventional pollutants (SO_2, NO_x, PM_{10}) than conventional PC units, as well as facilitating mercury capture and using far less water.

Furthermore, energy industry leaders such as General Electric have recently acquired the capability to build a complete 600 MW IGCC facility, for the first time bringing all the components of IGCC together in an integrated and cost-effective package. GE expects this approach alone will reduce the IGCC capital cost "penalty" to no more than 10%.

While it is true that no IGCC has yet been successfully demonstrated using western sub-bituminous coal, the inherent flexibility of the IGCC process gives it the ability to use a wide variety of feedstocks.[6] IGCC opponents often cite the loss of turbine efficiency as altitude increases as an insurmountable obstacle. However, this loss is only a few percent per thousand feet and has not prevented electricity generators from building new gas-fired combustion turbines on the Colorado Plateau. Recognizing these benefits, some western states (CO, WY, and MT) have adopted policies to promote IGCC projects.

We have received applications for seven proposed IGCC facilities[7] and their relative emissions (in terms of lb/MWh_{net} for SO_2, NO_x, and filterable PM_{10} and in lb/GWh_{net} for mercury) are shown in Figure 1 (attached) along with EEC. It is clear that IGCC is a cleaner coal-to-energy technology than the conventional PC boiler technology proposed by SPR.

In summation, while a state is not required to consider IGCC, it may do so, as has been demonstrated by New Mexico in its evaluation of the Mustang power plant, and by Illinois regarding the Indeck-Elwood project. All things considered, we believe it is time for new power generators to take a serious look at the sorts of "clean coal technologies" being promoted by our administration as it seeks to relieve our dependence upon foreign energy sources while protecting our environment. We also believe that the benefits of IGCC outweigh its costs and that IGCC is a leading candidate for that role, and should be considered by EEC. Since facilities such as EEC will likely be operating for the next 60 years or more, we believe Nevada Division of Environmental Protection (NDEP) should re-consider and re-evaluate IGCC.

Conventional PC Boiler BACT

SO_2: SPR and the NDEP have proposed wet scrubbing at 95.4% - 96.5% removal,[8] depending upon the averaging period. When burning coal with a sulfur content of 0.8% or less, uncontrolled SO_2 emissions

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[5] See NARUC resolution at http://www.naruc.org/Resolutions/ERE1%20Resolution%20on%20State%20Regulatory%20Policies%20Toward%20Climate%20Change.pdf

[6] According to Jenkins, IGCC can use any type of coal, as well as biomass. There is an IGCC in Sweden using chicken litter.

[7] American Electric Power-Mountaineer (WV), Southwestern Power Group-Bowie (AZ), Cash Creek (KY), Excelsior Energy-Mesaba (MN), Southern Co.-Orlando (FL), Pacific Mountain Energy Company (WA), Steelhead (IL)

[8] Removal efficiency is to be determined by procedures established in 40 CFR Part 60.49 Da (b)(3) which allows the sulfur concentration at the scrubber inlet to be estimated based upon the sulfur content of the fuel fired. Since about 12.5% of the sulfur in the sub-bituminous coal to be burned at EEC is retained in the ash, the actual control efficiency, the amount of SO_2 removed by the scrubber, is correspondingly less than the

would be about 1.73 lb/mmBtu, and controlled emissions would be limited to 0.06 lb/mmBtu on a 24-hour average basis.

In comparing the performance of SO_2 scrubbers, one must consider that it is easier to achieve a higher control efficiency on a gas stream with a higher inlet SO_2 concentration, but more difficult to achieve a lower outlet concentration. So, if one can achieve a lower outlet concentration on a "dirtier" gas stream, it would indicate a higher degree of scrubbing success. We have identified in Table 1 (attached) two projects (Florida Power & Light-Glades and Taylor) proposing to burn coals with higher uncontrolled SO_2 emissions but with much lower controlled emissions. The uncontrolled emission rates (bolded values) in Table 1 are derived from the sulfur and heat contents of the coals burned, as well as the uncontrolled emission factors from EPA's "Compilation of Air Pollutant Emission Factors" (AP-42).[9] For example, if EEC were to achieve the same 98.7% SO_2 control as the Glades ultra-supercritical PC proposed by Florida Power & Light, its emissions would be reduced by 33% (or 1,525 TPY).

NO_x: SPR/NDEP have proposed a 24-hour average limit of 0.06 lb/mmBtu for NO_x using low NO_x burners and selective catalytic reduction (SCR). We have identified in Tables 2a – 2c projects proposing to burn coals with lower NO_x emissions. We agree that SCR represents appropriate control technology, and suggest that NDEP should consider the lower limits proposed by Florida Power & Light for its Glades project and permitted by Wyoming for Basin Electric's dry Fork project. If EEC were to achieve the 0.05 lb/mmBtu rate proposed for Glades, its emissions would be reduced by 17% (or 635 TPY).

PM_{10}: SPR/NDEP have proposed a three-hour rolling average limit of 0.01 lb filterable PM_{10}/mmBtu and 0.02 lb/mmBtu for filterable and condensable emissions. Based upon the values posted in Table 3, this is as good as any project we have seen and represents BACT.

Sulfuric Acid Mist (H_2SO_4): SPR/NDEP have proposed a three-hour rolling average limit of 0.0004 lb H_2SO_4 /mmBtu, which is much higher than the numerous projects listed in Table 4. NDEP should explain why this project should be allowed to emit almost four times as much sulfuric mist (on a heat input basis) as the Newmont Nevada project.

Mercury (Hg): The draft permit would allow up to 260 pounds of mercury to be emitted every year. Although mercury is not subject to PSD, other new PC boiler projects (e.g., Florida Power & Light's 2000 MW Glades project and Longleaf Energy's 1,200 MW Hilton, GA project) are proposing to inject powdered activated carbon (PAC) to reduce mercury to about half the federal emission limit. Montana has recently issued a permit to the new Highwood boiler which requires installation and operation of a PAC system which will reduce mercury emissions from PRB coal (similar to what EEC would burn) by at least 90 %. Although SPR has proposed a PAC system, the draft permit does not require its use, only that EEC's mercury emissions meet the federal standard that would result in the 260 pounds per year emission rate. We believe that NDEP should require that PAC be used to its fullest capabilities (e.g., the 90% control requirement in the Highwood Montana permit).

In summary, we believe that further consideration must be given to IGCC "clean coal" combustion technology, and believe that EEC could achieve lower SO_2, NO_x, Hg, H_2SO_4 and PM_{10} emission limits by

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removal efficiency. For example, if the sulfur content of EEC's coal were 0.3 %, the 91% removal requirement could be met by controlling 90% of the SO_2 entering the scrubber.

9 For the sake of consistency, it is assumed that the SO_2 emission factor is dependent upon the coal type, but independent of the boiler type. The natural process of retention of sulfur in the ash is just as fundamental a characteristic of the coal burned as its sulfur content and its heating value. So, bituminous coals would emit 95% of their sulfur content as SO_2, while sub-bituminous coals would emit 87.5% and lignites 75%.

either choosing an inherently cleaner coal combustion technology or by more effectively using the control technologies chosen for the boiler. Figure 2 (attached) illustrates some of the differences between EEC and the Florida Power & Light Glades project.

Compliance Monitoring

We recommend that the NDEP add a PM_{10} continuous emission monitor (CEM) requirement. For example, the West Virginia Division of Air Quality has included both filterable and condensable PM_{10} in its permit limit for Longview Power. We continue to believe that CEMs are an important tool for monitoring compliance. For that reason, we recommend that EEC install PM CEMs.

Air Quality/ Air Quality Related Values (AQRV) Modeling Analysis

The far field air quality modeling analysis was based on the EPA guideline CALPUFF modeling system. SPR used CALPUFF Version 5.711a and its suite of associated processors. SPR also used several post-processors: CALPOST Version 5.6393 for visibility; and CALSUM and POSTUTIL from the non-guideline VISTAS CALUFF suite. The NPS approves the use of the guideline CALPUFF 5.711a suite as well as the limited use of the VISTAS post-processors due to the fact that the VISTAS versions do contain features that allow easier computation of AQRV impacts. The modeling analysis was generally based on recommendations found in the FLAG document and the EPA Interagency Workgroup on Air Quality Modeling (IWAQM). The years of 2002, 2003, and 2004 were modeled in the analysis. The modeling domain consisted of 111 by 229 three-kilometer grid cells. The receptors in the Class I area Zion NP are based on the NPS receptor data base and the Class II receptors for Great Basin NP are based on a 1.0 kilometer grid developed by SPR.

We attempted to corroborate the results of the SPR CALPUFF analysis, and were unable to do so for the year 2003. For the year 2002, we successfully were able to generate a CALMET year for 8,617 consecutive hours (359 days). However, there were too many missing hours of upper air data on December 26, 2002 to complete the year. Therefore, our results for the year 2002 are based on the run length of 359 days.

For the year 2004, we experienced another problem with the upper air data. In the upper air data from the Mercury Test Site National Weather Service station in Nevada, three of the first ten soundings of April 2004 were missing. Since CALMET would not run with that many missing soundings in a five day period, we created two CALMET data files for April, 2004. The CALMET data file for the first five days of April 2004 was generated with only three upper air stations. The remainder of April, from April 6 thru April 30, was then processed with the four upper air stations. The rest of the 2004 CALMET data was also generated with the four upper air stations. We believe that, although the CALMET files we generated for 2002 and 2004 have small amounts of missing data, this should not significantly affect the modeling results and are therefore two valid years for PSD permitting purposes.

We could not run the 2003 meteorological data to create a useable CALMET file for that year. We not only attempted to generate a 2003 CALMET data file with CALMET 5.53a, which is part of the CALPUFF 5.711a system, but we also tried with other versions of CALMET to no avail. That is, we attempted to exercise the VISTAS version of CALMET, the newest guideline version of CALMET version 5.8, and several other versions of CALMET. All attempts were unsuccessful. We sent several e-mails on and after November 20, 2007 to the SPR consultants requesting either a new set of the raw meteorological data necessary to run CALMET, or the executable CALMET file that was used by the applicant. We did not receive any information on this matter from the SPR consultant. We also contacted the State of Nevada permitting branch, but were told to note this issue in our formal comments, which we are doing as part of this technical support document. As a general comment, the NPS is puzzled how the SPR consultant was supposedly able to run three complete years of CALPUFF/CALMET without running into the same problems discussed above.

Single Source Analysis: Some EEC emission rates were mischaracterized in the modeling conducted by SPR, thus underestimating visibility impacts at Great Basin NP and Zion NP. Table 6 illustrates that SPR modeled more fine PM_{10} and less condensable inorganic PM_{10} (IOR CPM) than NPS believes to be appropriate.

Table 6 – EEC Emission rates modeled for 24-hour impacts on visibility

Lb/hr Modeled by	SO2	NOx	Coarse PM10	Fine PM10	EC	IOR CPM	OR CPM	Total PM10
SPR	1045.2	1045.2	87.2	153.4	3.3	68.2	34.8	346.9
NPS	1045.2	1045.2	87.1	83.9	3.2	139.4	34.8	348.4
Proposed permit limits	1045.2	1045.2						348.4

We disagree with SPR's categorization of HCl and HF as Fine (filterable) PM_{10}. Instead we believe that, because of the hygroscopic nature of HCl and HF in the presence of atmospheric water vapor,[10] both should be treated as IOR CPM. By shifting these hygroscopic compounds from the inorganic condensable category to the non-hygroscopic fine particle category, the impacts of these compounds upon visibility are artificially and incorrectly decreased.

In order to account for this error, we conducted a second set of CALPUFF runs for 2002 and 2004 with the speciated PM emissions we thought were more appropriate. We conducted our own modeling analysis, which is presented along with SPR's results below. The impacts to visibility using the NPS emissions and FLAG Method 2 are found in Table 8b, and the results with the NPS emissions and Method 6 and annual natural background are found in Table 10c.[11]

Air Quality Impact Analysis Results

PSD Increment Consumption:

SPR modeled its proposed maximum 24-hour emissions to calculate all impacts except for the three-hour SO_2 impacts. The three-hour SO_2 increments were modeled in separate runs to address the higher short-term emissions. The results of the single source increment impacts are summarized in the Table 7. The model predicts concentrations above the three-hour and 24-hour SO_2 Class I significant impact levels for increment consumption at Zion NP. For PM_{10}, NO_x, and annual mean SO_2 concentrations, the maximum impacts are less than their respective significant impact levels. Because the three-hour and 24-hour SO_2 Class I significant impact levels were exceeded, a cumulative CALPUFF modeling analysis was triggered for those pollutants and averaging periods.[12]

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[10] "Hydrogen Fluoride Study, Final Report, Report to Congress, Section 112(n)(6), Clean Air Act as Amended"

[11] In corroborating the modeling results in the application, we ran CALPUFF for the years 2002 and 2004 with SPR's proposed emissions rates. We calculated results that were very similar in magnitude and frequency for increment, acid deposition impacts, and the unadjusted (no 8[th] high or weather events) visibility impacts for both Method 2 and Method 6 with annual natural background extinction.

[12] Our results did not differ substantially from those presented by SPR.

Table 7 – SPR's Class I PSD Increment Modeling Results (micrograms per cubic meter)

Pollutant	Significant Level & PSD Increment	Zion National Park
EEC Project Only - Sulfur dioxide (SO_2)		
3-hour	**1.0**/25	**1.04**
24-hour	**0.2**/5	**0.23**
Annual	0.1/2	0.01
Particulate matter (PM-10)		
24-hour	0.3/8	0.12
Annual	0.2/4	0.004
Nitrogen dioxide (NO_2)		
Annual	0.1/2.5	0.001
Cumulative Impact Modeling - Sulfur dioxide (SO_2)		
3-hour	25	1.84
24-hour	5	0.53

Cumulative Analysis: A cumulative analysis of three-hour and 24-hour SO_2 increment consumption at Zion NP was triggered. In conducting this analysis of cumulative SO_2 increment consumption/expansion at Zion NP, it is necessary to determine the minor source baseline date (MiSBD) for Zion for SO_2 for each applicable averaging period; this becomes the reference date for determining changes in emissions. According to SPR, the MiSBD for Zion NP is April 1, 1990. However, we believe that the MiSBD for Utah (and Zion) was triggered much earlier when PSD permits were issued by Utah in 1980 for the Intermountain Power and Hunter #3 projects.[13] In that case, SPR's analysis is invalid, and NDEP must determine the correct MiSBD for Zion and SPR must re-do the cumulative increment analysis on that revised basis.

SPR does not describe how the emission rates in its Table 3-5 "Regional SO2 Emission Source Inventory" were derived, but presents results which purport to show that the increments are not exceeded at Zion NP. However, no explanation was provided telling from what year(s) the inventory was derived, and we cannot confirm that it was done correctly. For example, we have the following questions and concerns about the inventory as presented:

> Why were Intermountain Power units #1 & #2 excluded, while Unit #3 was included? Units #1 & #2 exhaust through a common stack located at the same facility, have similar emissions, and consume increment. SPR modeled 857.2 lb/hr for Reid Gardner Unit #2 for both three-hour and 24-hour increment consumption. However, on March 20, 2005, Reid Gardner Unit #4 emitted SO_2 at a three-hour average rate of 1101 lb/hr. On June 3, 2003, Reid Gardner Unit #4 emitted SO_2 at a 24-hour average rate of 873 lb/hr. On June 5, 2006, Reid Gardner Unit #4 emitted SO_2 at a three-hour average rate of 1834 lb/hr. SPR should have modeled these higher rates.

EEC should provide information on the relevant MiSBDs and how emissions changes were determined relative to those dates.

We conducted an analysis of the cumulative impact of the EEC and White Pine projects and our results are presented below.

[13] Because the MiSBD is triggered when the first PSD application is deemed complete by the permitting authority, it would have been triggered before these permits were issued.

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SO2 Increment Consumption due to EEC + White Pine for Years 2002-2004

National Park	Increment	GRBA			Zion			Increment
Year modeled		2002	2003	2004	2002	2003	2004	
3-hr SO2 (µg/m^3)	512	10.12		10.13	1.04		1.49	25
24-hr SO2 (µg/m^3)	91	5.36		5.36	0.40		0.57	5

Neither the Class II increments at Great basin NP nor the Class I increments at Zion NP were exceeded.

Full Impact Analysis

Since, according to SPR, the "EEC project is expected to induce a small amount of growth in the air basin," no secondary emissions were included in the analysis.

Air Quality Related Values (AQRVs)

Visibility

Zion NP has some of the best visibility in the 48 contiguous states. Nationwide studies indicate that the intermountain West enjoys the best visibility in the coterminous United States, from the southern Cascades, eastward across the Great Basin and Snake River Plain, to the northern Colorado Plateau and central Rocky Mountains. Zion NP, which is located in the middle of this region, has been monitoring visibility since 2000. Results form that monitoring effort show that Zion NP is among the best in the nation for clear air and outstanding visibility. Issuance of a permit for the levels of emissions predicted in the proposed EEC and White Pine projects would compromise visibility at Zion NP. According to our FLAG guidance:

> If the visibility impact of a proposed source is less than a 5% change in extinction a cumulative analysis would not be expected. For visibility impairment predicted to be above 5%, but less than 10%, change in extinction from a proposed source, a cumulative analysis is expected. If the visibility impairment is predicted to be greater than 10% from a proposed source, the federal land manager is likely to object to the project regardless of other source growth, unless there is mitigation.

SPR performed several visible haze impact analyses with three different methodologies for both Great Basin NP and Zion NP. SPR conducted the standard FLAG 2000 methodology known as Method 2 where the relative humidity values are used from the actual meteorological data and the background extinction is based on average annual conditions. Note that, for the Great Basin NP analysis, the background extinction conditions for the nearest Class I area, Jarbidge Wilderness Area were applied as the values for Great Basin NP. In its Method 2 analysis, SPR attempted to dismiss some of its impacts at Zion NP and Great Basin NP due to "weather events." The federal land managers do not accept the elimination of visible impact days based on perceived weather obscuration. The PSD application reported visibility impact results for the EEC by itself over the three-year modeling period. Those results are shown in Table 8a for the approach recommended by our FLAG guidance.

Table 8a – SPR Visibility Modeling Results using FLAG Method 2

EEC Project Only	Great Basin National Park	Zion National Park
Maximum Change in Extinction	68.8%	30.8%
Days over 5%	**206**	**17**
Days over 10%	**104**	**4**

Due to our concerns about the way in which SPR characterized particulate emissions from EEC, we conducted a modeling analysis using values for particulate emissions that we believe are more representative of the behavior of those emissions. Because we could not get the modeling files provided by SPR to work for 2003, and because NDEP refused to address this issue, we are presenting data in Table 8b based upon only 2002 and 2004 meteorology.

Table 8b – NPS' Predicted Visibility Impairment due to EEC Alone for Years 2002-2004

National Park	Great Basin National Park			Zion National Park		
Year modeled using Method 2	2002	2003	2004	2002	2003	2004
# day with change in extinction > 5%	**77**		**69**	**4**		**7**
# day with change in extinction > 10%	**38**		**33**	**1**		**3**
Maximum change in extinction	73%		86%	31%		15%

According to the results from analyses by both SPR and NPS, the 5% "cumulative analyses" and the 10% "likely to object" thresholds are exceeded at Zion NP and Great Basin NP. Thus, the predicted impacts on visibility are not insignificant at Zion NP.

We are also concerned about the cumulative impacts from the EEC project and the proposed White Pine coal-fired power plant proposing to locate some 30 miles north-northwest from the EEC project. Since SPR did not conduct a cumulative analysis of visibility impacts, and the Ely area may experience the addition of two large coal-fired power plants, we conducted an analysis of the cumulative impacts on visibility at Great Basin NP and Zion NP. The results of our analysis are presented below.

A cumulative CALPUFF analysis was conducted using the SPR 2002 and 2004 CALMET data along with the NPS emission estimates of emissions from the proposed SPR generating station and the proposed White Pine power plant. The stack parameters and location of the proposed White Pine Power Plant were obtained from its recent permit application submittal. The results of our Method 2 analysis are found in Table 9.

Table 9 – NPS' Cumulative Visibility Impairment due to EEC + White Pine for Years 2002-2004

National Park	Great Basin National Park			Zion National Park		
Year modeled using Method 2	2002	2003	2004	2002	2003	2004
# day with change in extinction > 5%	133		105	17		12
# day with change in extinction > 10%	**85**		**64**	**5**		**8**
Maximum change in extinction	103%		197%	48%		28%

The predicted impacts on visibility at Zion NP are within the range of impacts that have previously been considered adverse when attributed to a single source.

The federal land managers are considering changes to their FLAG guidance that would incorporate EPA's visibility modeling methods used in its Best Available Retrofit Technology (BART) program. EPA recommends the use of its "Method 6" for the BART analysis, using either the 20% best visibility days or the annual average visibility as alternative background visibility values. To provide additional information, SPR conducted a second type of visibility analysis where it applied the background extinction of the 20% best natural days and monthly average relative humidity. In both of methods presented below, the threshold for "contributing" to visibility impairment is eight days in any one year with greater than five percent change in light extinction. Exceeding this threshold would typically mean that additional emission control measures should be considered. The threshold for "causing" visibility impairment is eight days in any one year with greater than ten percent change in light extinction.

In this supplemental analysis, SPR reported on the 98th percentile impacts (8th high per year) and also attempted to dismiss some of the impacts based on weather events. The federal land managers do not allow the 98th percentile impacts per year as a reporting cut off, but require that all impacts greater than a 5% change in extinction be reported. The proposed use of weather events to dismiss days of visibility impacts is illogical since the monthly relative humidity is based on a 30-year climatic average and weather events are already accounted for in the monthly average data. These results are found in Table 10a.

Table 10a – SPR's Visibility Modeling Results using Method 6 and 20% Best Background Days

EEC Project Only	Great Basin National Park	Zion National Park
Maximum Change in Extinction	24.5%	3.6%
Days over 5%	**244**	0
Days over 10%	112	0

The third visible haze analysis for supplemental information was similar to the second analysis except it used the annual average natural background extinction and the monthly average relative humidity and reported the 8th high per year. Here, too, the federal land managers require that all impacts with greater than a 5% change in extinction be reported. As stated earlier, the proposed use of weather events to dismiss days of visibility impacts is illogical since the monthly relative humidity is based on a 30-year climatic average and weather events are already accounted for in the monthly average data. These results are found in Table 10b.

Table 10b – SPR's Visibility Modeling Results using Method 6 and Annual Average Background

EEC Project Only	Great Basin National Park	Zion National Park
Maximum Change in Extinction	18.8%	2.8%
Days over 5%	**194**	0
Days over 10%	72	0

SPR's results from each of these analyses show that EEC's impacts would be below the pertinent 10% and 5% change in extinction impact thresholds at Zion NP, but far above them at Great Basin NP. Similar results were obtained by NPS for 2002 and 2004 using the annual average visibility as background and are presented in Table 10c.

Table 10c – NPS' Visibility Modeling Results using Method 6 & Annual Average Background for Years 2002-2004

National Park	Great Basin National Park			Zion National Park		
Year modeled using Method 6	2002	2003	2004	2002	2003	2004
# day with change in extinction > 5%	**93**		**68**	1		3
# day with change in extinction > 10%	35		33	1		1
Maximum change in extinction	36%		62%	12%		11%

Regardless of the modeling method used, EEC would cause unacceptable visibility impairment at Great Basin NP, and would be below the pertinent 10% and 5% change in extinction impact thresholds at Zion NP. However, when we evaluated the cumulative impacts of both EEC and White Pine (Table 10d), we predict more than the seven days per year with visibility changes above the 5% threshold at Zion for both years modeled; this suggests that, even if Method 6 were used, the cumulative impacts from these two plants would exceed EPA thresholds for "significant" visibility impairment at Zion NP.

Table 10d – NPS' Cumulative Visibility Impairment due to EEC + White Pine Visibility Modeling Results using Method 6 and Annual Average Background for Years 2002-2004

National Park	GRBA			Zion		
Year modeled using Method 6	2002	2003	2004	2002	2003	2004
# day with change in extinction > 5%	147		**110**	**9**		**10**
# day with change in extinction > 10%	101		66	3		4
Maximum change in extinction	58%		151%	19%		18%

Deposition

Acid deposition harms aquatic and terrestrial life through direct contact and by changing the chemistry of surface water and soils. It can affect plants' seed germination and survival. Even dry acid deposition builds up on hairy surfaces of desert plants. Later dew or precipitation dissolves the deposition to form concentrated acid solutions that can harm foliage. Acid deposition is often accompanied by nitrogen deposition, which is an artificial fertilization which can favor certain plants over others and change the plant community structure. Acid deposition occurs when SO_2 and NO_x gases chemically change to sulfuric and nitric acid in the atmosphere and fall to the earth with rain and snow (wet deposition), or with dust and microscopic particles (dry deposition).

SPR correctly conducted acid deposition analyses for total sulfur and total nitrogen at both Great Basin NP and Zion NP for all three years. At Zion NP, the modeled deposition rates (Table 11) due to EEC alone are predicted to be below the 0.005 kilograms per hectare per year (kg/ha/yr) deposition analysis thresholds (DATs)[14] for sulfur and nitrogen during each of the three years modeled.[15]

Table 11 a – Deposition Modeling Results (kg/ha/yr)

	Deposition Analysis Threshold	Zion National Park	Great Basin National Park
EEC Project Only			
Sulfur	**0.005**	0.003	**0.085**
Nitrogen	**0.005**	0.002	**0.042**

However, when we modeled the cumulative impacts of both EEC and White Pine at Zion NP, we predicted that our 0.005 kg/ha/yr DAT would be exceeded for sulfur deposition.

Table 11b – Acid Deposition due to EEC + White Pine for Years 2002-2004

National Park	DAT	GRBA			Zion		
Year modeled		2002	2003	2004	2002	2003	2004
S deposition (kg/ha/yr)	**0.005**	**0.1601**		**0.1280**	**0.0065**		**0.008**
N deposition (kg/ha/yr)	**0.005**	**0.0732**		**0.0580**	0.0023		0.004

[14] NPS has developed deposition analysis thresholds to evaluate new sources of air pollution. Predicted deposition impacts below the thresholds are considered insignificant (http://www2.nature.nps.gov/air/Pubs/pdf/flag/nsDATGuidance.pdf).
[15] Our results did not differ substantially from those presented by SPR.

Nitrogen and sulfur compounds can acidify poorly buffered soils, lakes, and streams.

In addition to contributing to acidification, sulfur deposition contributes to the formation of methylmercury in the environment, if mercury is present. Methylmercury is extremely toxic and bioaccumulates in fish and wildlife, affecting health and reproduction. Because mercury emissions from the project are estimated at 260 lb/yr, the resulting increase in mercury deposition, coupled with the significant increase in sulfur deposition, could impact park resources.

Conclusions: While the impact of EEC's emission alone is unlikely to exceed our threshold for concern at Zion NP, the cumulative impacts of EEC plus White Pine have the potential to increase sulfur deposition in Zion NP to above that threshold. Therefore, as discussed above, EEC (and White Pine) should reduce SO_2 emissions as much as possible.

Ozone

Ozone is formed in the atmosphere by reactions of hydrocarbons and nitrogen oxides. EEC would be an emitter of nitrogen oxides and may exacerbate ozone levels at Zion NP. The metric for comparing ozone concentrations against the National Ambient Air Quality Standard is calculated as the three year average of the 4th highest eight-hour average ozone concentration. Using this metric, ozone concentrations measured at Zion NP are high for a rural area at 72 parts per billion (ppb). Currently an exceedance of the standard occurs at 85 ppb. However, EPA is evaluating the current standard and is likely to lower the value. The proposed new standard could be as low as 70 ppb. If it is lowered to that level, the park will be in non-attainment status for ozone. Analyses have not been conducted to verify the effect on ozone concentrations, but elevated ozone levels should be a concern for air quality management in the region. In addition to being a concern for human health, ozone can harm plants. Ozone can cause foliar injury to sensitive plants and can reduce plant growth and health. In 1999 the NPS Air Resources Division surveyed vegetation at Zion and found probable ozone injury on several species of vegetation including snowberry. Surveys in nearby parks (Cedar Breaks National Monument and Bryce Canyon National Park) found ozone injury on elderberry.

Procedural Concerns

We are concerned that the NDEP did not follow proper procedures regarding publication of its Public Notice of the EEC application. 40CFR51.166 (q) regarding public participation states that the reviewing authority shall (iii) "Notify the public, by advertisement in a newspaper of general circulation in each region in which the proposed source would be constructed... the degree of increment consumption that is expected from the source or modification..." Although the EEC project would significantly impact increment at Zion NP, NDEP provided no information regarding any increment consumption in the Class I area. Because NDEP did not provide in its Notice to the public the degree of increment consumption in each affected Class I area, it failed to properly advise the public of the impacts in these sensitive areas.

We are also concerned that NDEP did not provide "all information relevant to the permit application within 30 days of receipt of and at least 60 days prior to public hearing by the State on the application for permit to construct. Such notification must include an analysis of the anticipated impacts on visibility in any Federal Class I area," as required by 40CFR51.307, when it denied our request for the files necessary to model the impacts of the EEC project using 2003 meteorological data, as discussed above.

Conclusions and Recommendations

- EEC should re-consider use of IGCC technology to utilize coal to produce energy with less pollution.
- EEC has not justified its need for a NO_x limit that is higher than 0.05 lb/mmBtu.

- EEC has not justified its need for a SO_2 limit that is higher than the examples cited in this report.
- NDEP should require that powered activated carbon be used to its fullest capability (e.g., 90% control) to reduce mercury emissions.
- The modeling analysis for Class I cumulative SO_2 increment consumption at Zion NP was done incorrectly. The air pollutant dispersion modeling analyses presented to date indicate that EEC would have a significant impact on the three-hour and 24-hour SO_2 increments at Zion National Park. EEC should provide information on the relevant Minor Source Baseline Dates and how emissions changes were determined relative to those dates. No explanation was provided as to what year(s) its cumulative SO_2 inventory was derived from, or how emission rates were determined.
- Visibility impacts at Zion NP from EEC alone are not insignificant, and the combined impacts from EEC and the White Pine project and are within the range of impacts at Zion NP that has previously been considered adverse when attributed to a single source.
- Acid deposition at Zion NP from EEC alone would be below our thresholds of concern. However, the cumulative impact from both the EEC and White Pine projects could exceed that threshold for sulfur deposition.
- NDEP did not follow proper procedures regarding publication of its Public Notice.
- NDEP did not provide "all information relevant to the permit application" as required by 40CFR51.307.

Figure 1. Ely Energy Center vs. IGCC Comparisons

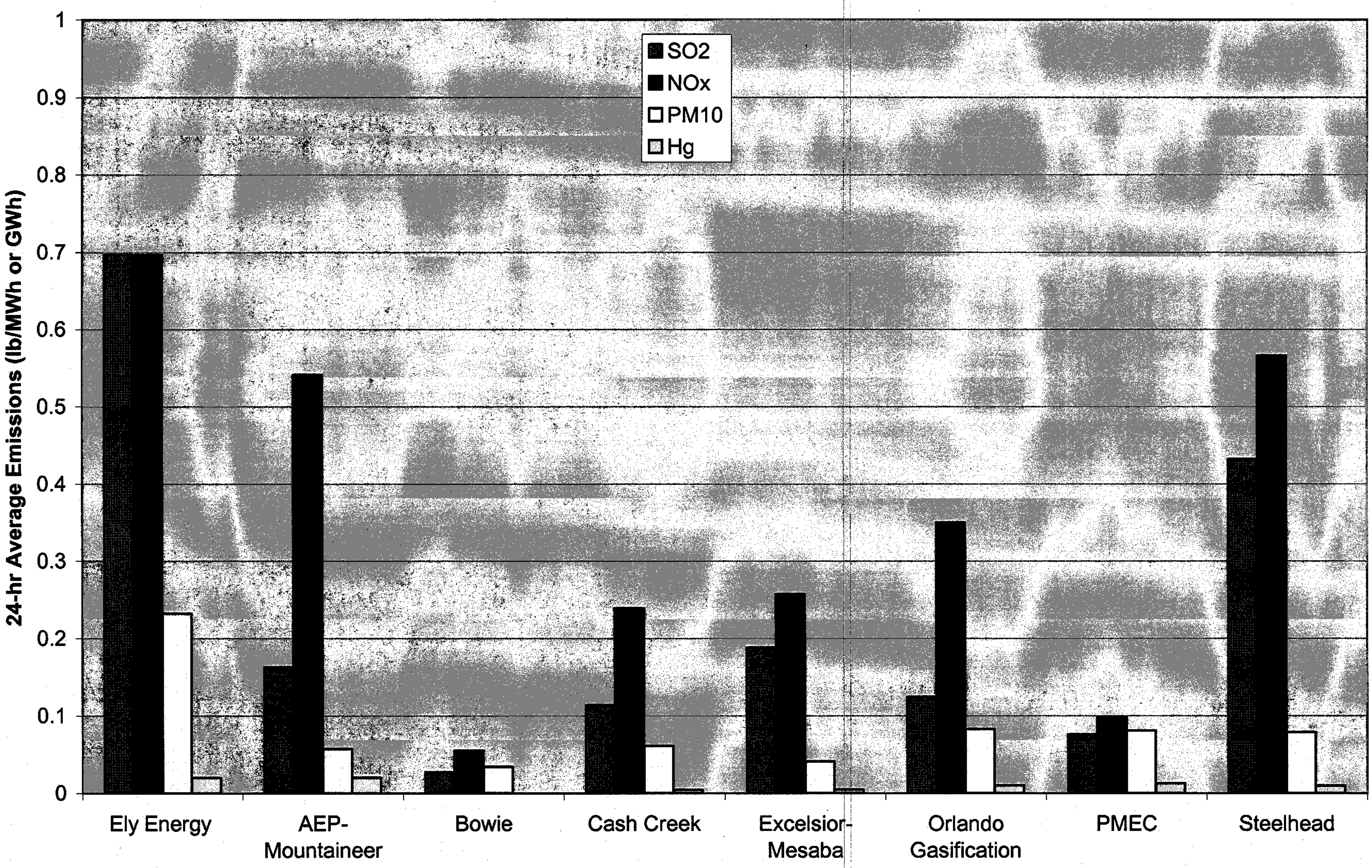

Figure 2. PC Emissions

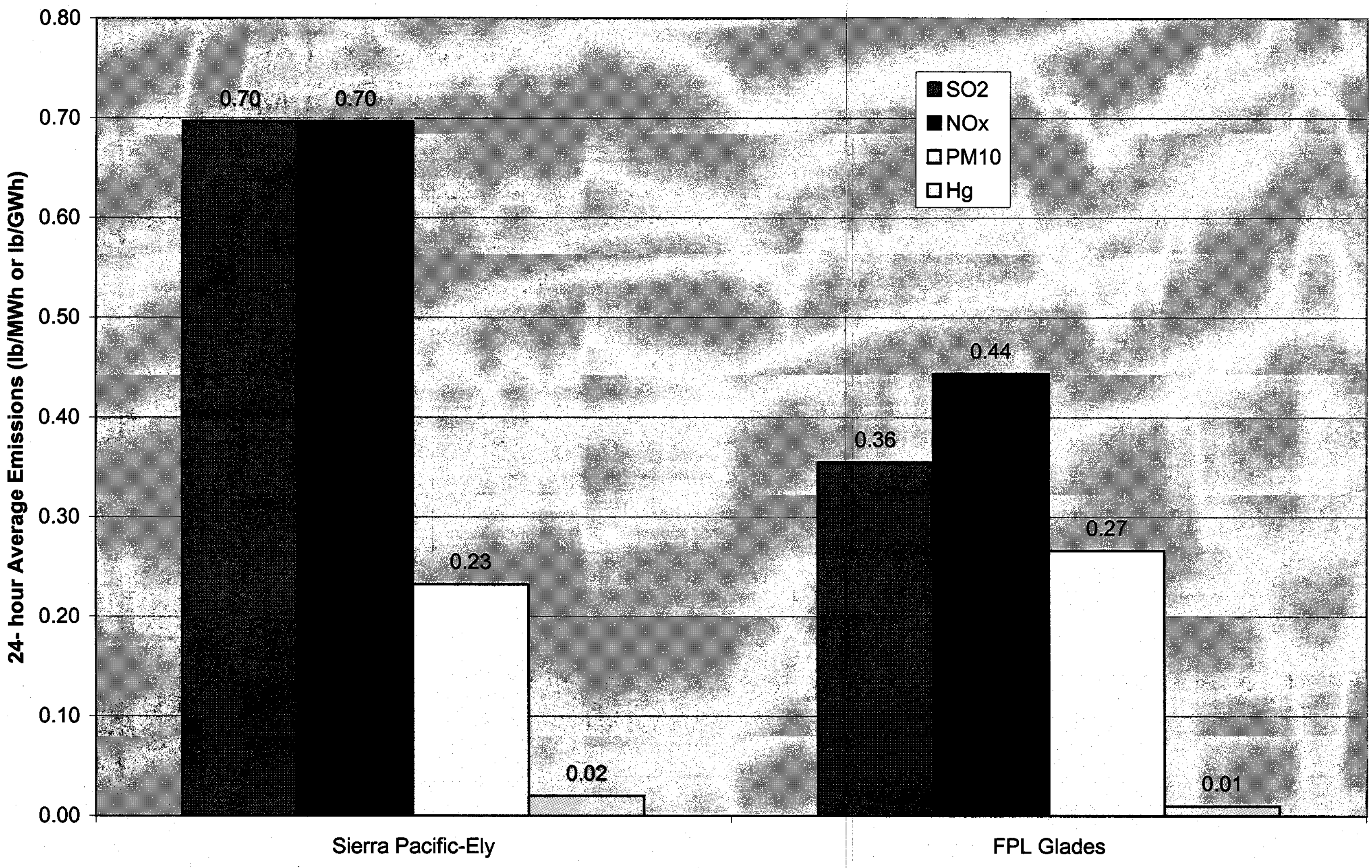

Table 1a – SO_2 Rankings (1-hour & 3-hour Averaging Periods)

Facility Name	Status	Permit	Boiler	Coal Quality			Capacity			Emissions of Limits*			Period	Control	
			Type	%S	Btu/lb	lb/mmBtu	MW	Total	mmBtu/hr	lb/mmBtu	lb/hr	lb/MW	(hr)	Type	%
Sierra Pacific-Ely	application	NV	PC	0.8	8100	1.728	2X750	1500	17420	0.080	1394	0.93	3	LSD	95.4
FPL-Glades	application	FL	PC	1.98	12324	3.053	2X980	1960	17400	0.065	1131	0.58	3	WLS	97.9
* Actual emissions from existing sources or proposed or permitted limits for new sources.															

Table 1b – SO_2 Rankings (24-hour Averaging Period)

Facility Name	Status	Permit	Boiler	Coal Quality			Capacity			Emissions of Limits*			Period	Control	
			Type	%S	Btu/lb	lb/mmBtu	MW	Total	mmBtu/hr	lb/mmBtu	lb/hr	lb/MW	(hr)	Type	%
Sierra Pacific-Ely	application	NV	PC	0.8	8100	1.728	2X750	1500	17420	0.060	1045	0.70	24	LSD	96.5
FPL-Glades	application	FL	PC	1.98	12324	3.053	2X980	1960	17400	0.040	696	0.36	24	WLS	98.7
Taylor	application	FL		3.46	7475	8.100	800	800	7475	0.055	411	0.51	24	WLS	98.3
* Actual emissions from existing sources or proposed or permitted limits for new sources.															

Table 1c – SO_2 Rankings (30-day Averaging Period)

Facility Name	Unit	Status	Perm it	Boiler Type	Year	Coal Quality			Capacity			Emissions of Limits*			Period (hr)	Control	
						%S	Btu/lb	lb/mmBtu	MW	Total	mmBtu/hr	lb/mmBtu	lb/hr	lb/MW		Type	%
Navajo	2	operating	AZ	PC	2000	0.53	10919	0.922	803		8563	0.044	323		720	WLS	95.5
Sierra Pacific-Ely		application	NV	PC		0.8	8100	1.728	2X750	1500	17420	0.060	1045	0.70	720	LSD	96.5
FPL-Glades		application	FL	PC		1.98	12324	3.053	2X980	1960	17400	0.040	696	0.36	720	WLS	98.7
Taylor		application	FL			3.46	7475	8.100	800	800	7475	0.040	299	0.37	720	WLS	99.5
* Actual emissions from existing sources or proposed or permitted limits for new sources.																	

Table 1d – SO_2 Rankings (Annual Averaging Period)

Facility Name	Status	Permit	Boiler	Coal Quality			Capacity			Emissions of Limits*			Period	Control	
			Type	%S	Btu/lb	lb/mmBtu	MW	Total	mmBtu/hr	lb/mmBtu	lb/hr	lb/MW	(hr)	Type	%
Sierra Pacific-Ely	application	NV	PC	0.8	8100	1.728	2X750	1500	17420	0.060	1045	0.70	8760	LSD	95.5
FPL-Glades	application	FL	PC	1.98	12324	3.053	2X980	1960	17400	0.040	696	0.36	8760	WLS	98.7
* Actual emissions from existing sources or proposed or permitted limits for new sources.															

Table 2a – No_x Rankings (1, 3, & 24-hour Averaging Periods)

Facility Name	Status	Permit #	Boiler Type	Capacity MW	Capacity Total	Capacity mmBtu/hr	Emissions or Limits * lb/mmBtu	Emissions or Limits * lb/hr	Emissions or Limits * lb/MW	Period (hr)	Control Type	Control %
FPL-Glade	application	FL	PC	2X980	1960	17400	0.05	847	0.43	22	SCR	87.7
Cash Creek	application	KY	DB-PG	2X500	1000	9652	0.05	483	0.48	24	LNB/OFA/SCR	88.8
LG&E-Trimble County	application	KY	PC	750		6942	0.05	348	0.46	24	SCR	86.1
Sierra Pacific-Ely	application	NV	PC	2X750	1500	17420	0.060	1045	0.70	24	SCR	90.3

* Actual emissions from existing sources or proposed or permitted limits for new sources.

Table 2b – No_x Rankings (720-hour Averaging Periods)

Facility Name	Status	Permit #	Issue/Op Date	Boiler Type	Capacity MW	Capacity Total	Capacity mmBtu/hr	Emissions or Limits * lb/mmBtu	Emissions or Limits * lb/hr	Emissions or Limits * lb/MW	Period (hr)	Control Type	Control %
Black Hills Pwr – WYGEN 3	issued	WY	2/5/07	PC	100		1300	0.05	65	0.65	720	LNB/SCR	89.3
FPL-Glade	application	FL		PC	2X980	1960	17400	0.05	870	0.44	720	SCR	87.7
Cash Creek	application	KY		DB-PC	2X500	1000	9652	0.05	483	0.48	720	LNB/OFA/ SCR	88.8
Basin Elec-Dry Fork	permit	WY	10/15/07	PC	385	385	3801	0.050	190	0.49	720	LNB/SCR	92.2
Sierra Pacific-Ely	application	NV		PC	2X750	1500	17420	0.060	1045	0.70	720	SCR	90.3

* Actual emissions from existing sources or proposed or permitted limits for new sources.

Table 2c – No_x Rankings (8760-hour Averaging Periods)

Facility Name	Status	Permit #	Boiler Type	Capacity MW	Capacity Total	Capacity mmBtu/hr	Emissions or Limits * lb/mmBtu	Emissions or Limits * lb/hr	Emissions or Limits * lb/MW	Period (hr)	Control Type	Control %
FPL-Glade	application	FL	PC	2X980	1960	17400	0.050	870	0.44	8670	SCR	88
Cash Creek	application	KY	DB-PC	2X500	1000	9652	0.050	483	0.48	8670	LNB/OFA/SCR	88.8
Sierra Pacific-Ely	applicaiton	NV	PC	2X750	1500	17420	0.050	871	0.58	8670	SCR	91.9

* Actual emissions from existing sources or proposed or permitted limits for new sources.

Table 3 – PM10 Rankings

Facility Name	Status	Permit #	Boiler Type	Capacity MW	Capacity Total	Capacity mmBtu/hr	Emission Limits: Filterable lb/mmBtu	Filterable lb/hr	Filterable lb/MW	Period (hr)	Control Type	Total lb/mmBtu	Total lb/hr
Sithe-Toquop	application	NV	PC	750	750	6048	0.010	60	0.08		FF	0.030	181
Sithe-Desert Rock	application	NEPA	PC	750	1500	13600	0.010	136	0.09	3	FF	0.020	272
Two Elk Expansion	application	WY	PC	750	750	6285	0.010	63	0.08		FF		
Sierra Pacific-Ely	application	NV	PC	2X750	1500	17420	0.010	174.2	0.12		FF	0.020	348

Table 4 – H_2SO_4

Facility Name	Unit	Status	Permit	Issue Date	Boiler Type	Capacity			Emission Limits			Period (hr)	Control Type
						MW	Total	mmBtu/hr	lb/mmBtu	lb/hr	lb/MW		
Newmont Nevada		issued	NV	5/5/05	PC	200	200	2030	0.00102	2.1	0.010	24	LSD
Cash Creek		application	KY		DB-PC	2X500	1000	9652	0.00133	12.8	0.013	720	WLS
Basin Electric-Dry Fork		permit	WY	10/15/07	PC	385	385	3801	0.0025	9.5	0.025	720	CDS
Black Hills Pwr-WYGEN 3		issued	WY	2/5/07	PC	100		1300	0.0027	3.5	0.035	720	LSD
LS Power-White Pine		draft permit	NV		PC	3X530	1590	15648	0.0034	53	0.033	3	
LS Power-High Plains	1	application	CO		PC	600	600	6155	0.0034	21	0.035	3	LSD
Black Hills Pwr-WYGEN 2		issued	WY		PC	100		1300	0.0037	4.8	0.048	720	LSD
Black Hills Pwr-WYGEN 2		issued	WY	7/11/05	PC	100		1300	0.0037	4.8	0.048	720	LSD
LG&E-Trimble Country		application	KY		PC	750	750	6942	0.0038	26.6	0.035	720	WLS
Sithe-Desert Rock		application	NEPA		PC	750	1500	13300	0.00394	52.4	0.035	3	WLS
FPL-Glades		application	FL		PC	2X980	1960	17400	0.0040	70	0.036	3	WESP
Sierra Pacific-Ely		application	NV		PC	2X750	1500	17420	0.0040	69.7	0.046	3	WLS

Table 5 – Hg

Facility Name	Status	Permit	Issue Date	Boiler Type	Capacity			Emission Limits			Control Type
					MW	Total	mmBtu/hr	lb/mmBtu	lb/MW/hr	lb/yr	
FPL-Glades	application	FL		PC	2X980	1960	17400	1.1E-06	9.9E-06	170	PAC
Sierra Pacific-Ely	application	NV		PC	2X750	1500	17420	1.7E-06	2.0E-05	263	